

**Pelton Round Butte Fish Committee**

# **Reintroduction Road Map**

The reintroduction road map is a high level guide to strategies current and future, to impact the goal of returning self-sustaining and harvestable runs of spring Chinook, sockeye and summer steelhead to the Upper Deschutes Basin. Learn more about the history and purpose of our work in the [Executive Summary](#).

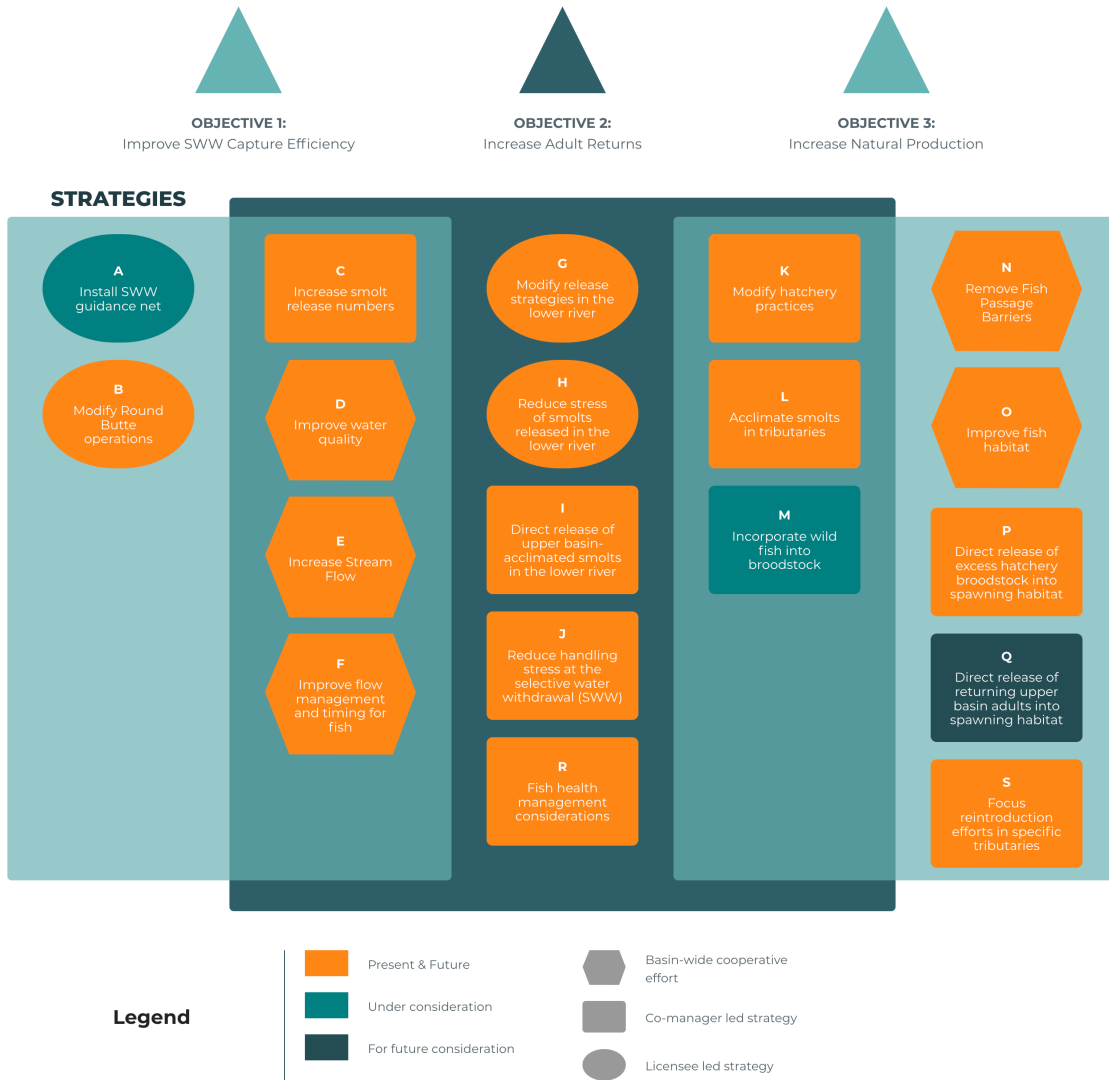
The road map is organized by objectives with each strategy represented by a shape that indicates who is responsible and a color to illustrate whether strategies are current or planned.

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# Overview of Reintroduction Road Map

Goal: self-sustaining and harvestable runs of Chinook, sockeye, and steelhead.





## STRATEGY

# A: Install SWW Guidance Net

**Description:** The principle behind installation of a fish guidance net system would be to improve collection of out-migrating salmonids. The guidance net would extend out from the Selective Water Withdrawal (SWW) and guide fish by inducing a sweeping current, parallel to the net, that leads migrating fish to the facility. It also prevents fish from swimming behind the SWW.

In the late 1980s, the number of outmigrants captured at Upper and Lower Baker Dams increased over 400% the first year, following installation of guide nets. However, fish collection efficiency increases attributable to installation of guidance net systems at other projects has varied widely due to variability in operating environments. The effectiveness of fish collection systems in northwest reservoirs has been linked to multiple factors, but collector inflow and effective forebay area stand out as variables that strongly influence guidance system success. At Round Butte Dam, collector inflow is at least six times that of the next highest system, while effective forebay area was intermediate within the eight systems examined, which suggests a positive impact to fish collection efficiency if guidance nets are installed.

**Anticipated Outcome:** Increase the number of smolts captured at the fish collection facility at the SWW.

**Evaluation Method:** The main categories of performance factors are:

- ▶ Fish Collection Efficiency – Tracked with annual monitoring of the percentage of PIT-tagged fish collected at the SWW from releases at the upper ends of the tributary arms. Given the likely effects of environmental flow variation on effectiveness of guidance nets, evaluation would be based on averages of discrete units stratified on periods of similar hatchery/acclimation operation, similar broodstock, and the SWW operation.

- ▶ Guidance System Integrity – This category includes debris collection, wear and abrasion, net deformation, and net inspection procedures. The proposed design of the guidance net is a curtain, and a very small mesh net below, that is designed to prevent capture or “gilling” of fish in the net.
- ▶ Perform acoustic study to determine fish behavior in the vicinity of the SWW in response to the presence of the guidance net.

**Timeline:** Under Consideration – Initial cost estimate in 2020 required additional supporting data to justify expense.

**Lead Organization/Agency:** Licensees.

**Fish Committee Role:** The Fish Committee provides input and approval.

**Related Studies/Actions/Decisions:**

**2022** – Installation of an SWW lead net is planned prior to 2022 smolt outmigration season.

**2020 – 2021** – Portland General Electric (PGE) contracts with U.S. Geological Survey (USGS) to conduct baseline acoustic studies to determine fish behavior in the vicinity of the SWW without the presence of a guidance net. Results of initial study leads to efforts, beginning in 2021, to “fine tune” hours of nighttime generation (Road Map Strategy B).

**2019 – 2020** – PGE and consultants collaboratively develop conceptual design and high-level cost estimate for guidance net to support PGE’s budgetary planning process. Initial cost estimate required additional data on benefits of net prior to decision on construction.

**2018** – Portland General Electric (PGE) begins researching guidance net effectiveness at other high head dams (Upper and Lower Baker, North Fork Reservoir and Swift Reservoir). PGE engineers do preliminary modeling to assess if Round Butte Dam would be a good candidate for a guidance net.

**2016** – Pilot testing of fish passage/flow model. PIT-tagged fish were released under varying conditions and their collection efficiency was

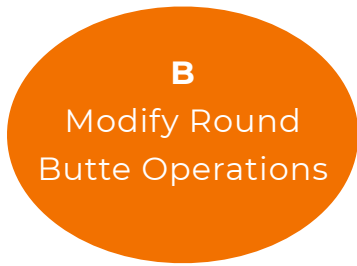
measured. Collection showed a positive response to increased nighttime flow (Pyper 2017).

**2015 - 2016** – Physical reservoir studies. Studies show that flows change with the SWW as predicted, but flow magnitudes are very low. Zone of influence shifts with changing generation (Nugraha and Khangaonkar 2017, Stillwater Sciences 2015).

**2014 - 2015** – Statistical model relating fish passage to generation is developed. This shows that more flow at night will likely improve fish passage collection (Pyper 2015, Pyper 2016).

**2010 - 2013** – Juvenile migration studies. Initial passage rates looked good; Licensees met the Phase 1 goal in year one of the SWW operations. Radio-tagging studies show that most fish enter the forebay, but many fail to enter the SWW, indicating an issue with either: 1) SWW avoidance, and/or 2) guidance. Acoustic studies in the forebay show long residence times (Hill et al. 2014, Thompson et al. 2013).

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## STRATEGY

# B: Modify Round Butte Operations

**Description:** The same water used for generation also serves as fish attraction water; therefore, by changing generation timing and level, we can affect Selective Water Withdrawal (SWW) collection efficiency. Analysis of fish collection data from 2010-2016 revealed a strong correlation between fish capture and generation levels with more fish collected when flow exceeded 5,000 cfs (Pyper 2016). A strong diurnal effect was also documented, with more fish collected during the early morning and evening hours (Pyper 2016). As a result, throughout the 2017 – 2020 migration seasons, the project operated consistently with increased nighttime flows, at a minimum of 4,500 cfs from 9:00 pm to 4:00 am, from March 15 to June 15, and captured a record number of smolts. Although this strategy is expected to continue into the future, flow levels and specific timing of nighttime generation may be changed based on future data collection and other considerations. For example, timing of 2021 nighttime generation flows were modified based on results of 2020 USGS sonar study. Additionally, low 2021 reservoir inflows did not allow continued release of 4,500 cfs during the nighttime generation period.

**Anticipated Outcome:** Reservoir passage efficiencies increase by 10-15%. Note: The fish response could change as smolt quality increases through hatchery changes, if there is a switch to wild broodstock or if a guidance net is constructed.

**Evaluation Method:** The evaluation period for this strategy has largely concluded and the strategy is now in the implementation phase. The Licensees will continue with annual monitoring of the percentage of PIT-tagged fish collected at the SWW from releases at the upper ends of the reservoir for comparison to the percentage collected before SWW

installation. In addition, fish passage/flow relationships will be quantified as described in Pyper 2017; initial analysis suggests a positive response in collection efficiency, especially with summer steelhead smolts, to the nighttime generation program. More in-depth studies may be designed if large-scale changes are made to the reintroduction program.

**Timeline:** Present and Future – Started in 2017 and anticipated to continue into the future. Specific timing and flow levels may be changed based on future data collection and other considerations.

**Lead Organization/Agency:** Licensees.

**Fish Committee Role:** Information is brought to the Fish Committee for input.

**Related Studies/Actions/Decisions:**

**2020 – 2021** – Portland General Electric (PGE) contracts with USGS to conduct baseline acoustic studies to determine fish behavior in the vicinity of the SWW without the presence of a guidance net. Results of initial study leads to efforts to “fine tune” hours of nighttime generation (Smith, C.D., Hatton, T.W., and Adams, N.S. 2021, Monitoring Fish Abundance and Behavior at a Selective Water Withdrawal Structure in Lake Billy Chinook, Deschutes River, Oregon, Using Multi-Beam Acoustic Imaging Sonar, Draft 2020: U.S. Geological Survey Open-File Report 2021)

**2016** – Pilot testing of fish passage/flow model. PIT-tagged fish were released under varying conditions and their collection efficiency was measured. Collection showed a positive response to increased nighttime flow (Pyper 2017).

**2015 - 2016** – Physical reservoir studies. Studies show that flows change with the SWW as predicted but flow magnitudes are very low. Zone of influence shifts with changing generation (Nugraha and Khangaonkar 2017, Stillwater Sciences 2015).

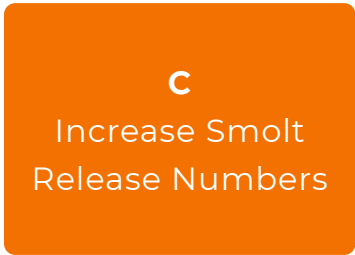


**2014 - 2015** – Statistical model relating fish passage to generation is developed. This shows that more flow at night will likely improve fish passage collection (Pyper 2015, Pyper 2016).

**2010 - 2015** – SWW Avoidance studies. Noise evaluation conducted by Bureau of Indian Affairs (BIA) determines not likely a deterrent. Lights turned off when the SWW personnel are not present. Experimental sprinklers are installed to break up the surface at the SWW fish entrances. These actions don't improve collection.

**2010 - 2013** – Juvenile migration studies. Initial passage rates looked good; Licensees met the Phase 1 goal in year one of SWW operations. Radio-tagging studies show that most fish enter the forebay, but many fail to enter the SWW, indicating an issue with 1) SWW avoidance and/or 2) guidance. Acoustic studies in the forebay show long residence times (Hill et al. 2014, Thompson et al. 2013).

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STRATEGY

# C: Increase Smolt Release Numbers

**Description:** With the upper Deschutes Basin reintroduction program initially based off fry releases, the number of smolts initially released was comparatively low when compared to other reintroduction efforts. The fish managers – ODFW and CTWS – terminated the fry release program due to concerns about genetic effects on native populations and when it became apparent that fry survival was inadequate to attain reintroduction program goals. Presently, 100,000 of both summer steelhead and spring Chinook smolts are released annually as part of the reintroduction effort. Increasing the number of smolts released above the Project will boost the probability that more smolts of both species will out-migrate.

**Anticipated Outcome:** Increase the number of out-migrating Chinook and steelhead smolts captured at the SWW. Subsequently, elevated adult returns are anticipated.

**Evaluation Method:** This can be evaluated by comparing the total smolts captured at the SWW pre- and post-increased releases. In subsequent years, similar comparisons can be made when these upper basin adult fish return to the Pelton Fish Trap, where pre and post-evaluations are made.

**Timeline:** Present and Future - As of 2021, 100,000 smolts of each species are released annually as part of the reintroduction effort. Production increases beyond this are under consideration and are dependent upon available funding and/or infrastructural improvements. Currently, the hatchery infrastructure in the basin can only support modest increases in smolt production. As such, smolt production will be limited unless increased hatchery infrastructure capacity is achieved. NOTE: due to lack

of broodstock, no spring Chinook salmon smolts will be available for the reintroduction program in 2023.

**Lead Organization/Agency:** The Oregon Department of Fish and Wildlife (ODFW) and The Confederated Tribes of the Warm Springs Reservation of Oregon (CTWSRO) are the authorities for fish management decisions in the basin. With regards to reintroduction, the role of the Licensees is to facilitate and, in some cases, administer the methods that result from fish management decisions.

**Fish Committee Role:** Information is brought to the Fish Committee for input.

**Relevant Studies/Actions/Decisions:**

**2018** – ODFW and CTWSRO agree to increase reintroduction smolt releases for both summer steelhead and spring Chinook to a total 100,000 for each species. Steelhead smolt production will remain at Wizard Falls Hatchery while spring Chinook smolts will be reared at Fall River Hatchery.

**2017** – Round Butte Spring Chinook Hatchery and Genetic Management Plan. Retrieved at <https://www.dfw.state.or.us/fish/hgmp/final.asp>

**2010 - present** – Juvenile Migration Test and Verification Study Annual Reports. Retrieved at <https://www.portlandgeneral.com/deschutesstudies>

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## STRATEGY

# D: Improve Water Quality

**Description:** Water quality in the Deschutes Basin is affected by a number of human activities. These range from discharge of pollutants from point sources, as well as more diffuse sources such as agriculture and forestry operations. Water quality is also affected by groundwater extraction the storage and release of water from reservoirs, and the diversion and return of water from out-of-stream uses. Water quality poses some challenges for reintroduction, but the nature of these challenges varies by location and includes concerns relating to temperature, dissolved oxygen, pH, algal blooms, turbidity, and hydromodification.

Water quality concerns by waterbody:

- ▶ Lake Billy Chinook experiences harmful algal blooms and exceedances of chlorophyll and pH criteria in the summer which, in turn, may affect water quality in the lower Deschutes River.
- ▶ The Metolius River has cold, clear water that generally meets Oregon's water quality standards for anadromous fish rearing, spawning, and migration.
- ▶ The accessible reaches of the Deschutes River, and its tributaries, exhibit temperature exceedances in the summer and pH exceedances from May through September. If anadromous fish spawning were to occur on the Deschutes River, temperature and dissolved oxygen concentrations would be a concern in May.
- ▶ Whychus Creek experiences temperature exceedances in the summer, related to irrigation withdrawal-induced low flows.
- ▶ In the Crooked River, temperature and dissolved oxygen concentrations are a concern in the summer and pH is a concern year-round. Total dissolved gases can cause gas bubble disease in fish below Bowman Dam when Prineville Reservoir releases exceed 600 cfs. Temperature, pH, and E. coli are concerns in the tributaries in summer.

Oregon Department of Environmental Quality (ODEQ) will develop a Total Maximum Daily Load (TMDL) for the upper Deschutes Basin in the next few years. This TMDL will establish limits on pollutant sources and expectations for implementing improvements. ODEQ will also continue to work with stakeholders throughout the basin to improve water quality, with the expectation that doing so will lead to improved habitat quality.

**Anticipated Outcome:** Gradual improvement of water quality and better support of habitat needs for fish and other aquatic life.

**Evaluation Method:** Ongoing monitoring and mathematical modeling of waterbodies in the basin to establish water quality condition. Cooperation with other monitoring entities to correlate water quality and habitat conditions.

**Timeline:** Present and Future.

**Lead Organization/Agency:** ODEQ is responsible for monitoring and assessing water in the Deschutes Basin and throughout Oregon. ODEQ maintains an impaired waters list (303d) that includes waterbodies that do not meet water quality standards. Other stakeholders provide monitoring information used to characterize individual waterbodies, including The Confederated Tribes of the Warm Springs Reservation of Oregon, watershed councils, and Oregon Department of Fish and Wildlife.

**Fish Committee Role:** No decision-making role, excluding the Project. The Fish Committee will still provide input to DEQ and help prioritize implementation of water quality restoration.

**Related Studies/Actions Decisions:**

**2021** – Water Quality Working Group completed graphic that showed basin-wide water quality issues, where ongoing collaboration to solve them was taking place, and where the highest priority areas and gaps for future work were.

**2021** – Completed Final Report on Lower Deschutes River Water Quality Study. The report (<https://portlandgeneral.com/about/rec-fish/deschutes-river/water-quality>) summarized 2015-2017 water quality monitoring in the three tributaries to Lake Billy Chinook, two sites in each impoundment and numerous sites along the lower Deschutes River and tributaries to the lower river. Monitoring results were then used to calibrate numerical models that allowed forecasts of possible changes to the lower Deschutes River water quality that could result from operational changes at Pelton Round Butte Project.

**2019** – Water Quality Workgroup, a subcommittee of the Pelton Round Butte Fish Committee, was formed and tasked with developing management recommendations out of Lower Deschutes River Water Quality Study and increasing public education about water quality issues in the Deschutes River Basin.

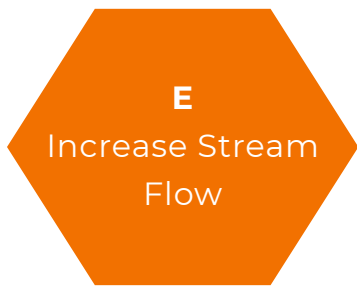
**2018** – Predicted Impacts of Bowman Dam Fish Passage and Remediation of Gas Bubble Disease on Redband Trout Production in the Crooked River Basin. 2018. Mount Hood Environmental, Boring, OR and Biota Pacific Environmental Sciences, Bothell, WA.

**2012** – 303(d) list. <https://www.oregon.gov/deq/wq/Pages/2012-Integrated-Report.aspx>. Oregon Department of Environmental Quality.

**2008** – Lower Crooked River Watershed Assessment. 2008. Crooked River Watershed Council. [http://crookedriver.deschutesriver.org/Publications/Technical\\_Resources/Lower+Crooked+River+Water+shed+Assessment+1/default.aspx](http://crookedriver.deschutesriver.org/Publications/Technical_Resources/Lower+Crooked+River+Water+shed+Assessment+1/default.aspx).

**2003** – Upper Deschutes Subbasin Assessment. 2003. Upper Deschutes Watershed Council. <https://www.upperdeschuteswatershedcouncil.org/publications/technical/>.

Ambient Water Quality Monitoring System. <https://www.oregon.gov/deq/wq/Pages/WQdata.aspx>. Oregon Department of Environmental Quality.



## STRATEGY

# E: Increase Stream Flow

**Description:** Instream flow quantity and timing is critical for major life stages and development of anadromous fish, in both the upper and lower Deschutes Basin. Basin studies indicate that an additional 130,000 acre-feet (AF) of instream flows in median water years will be needed to meet ODFW minimum streamflow targets and municipal water demands in the upper basin. Meeting broader ecological objectives will require the restoration of 200,000 AF to instream flows in median water years and 400,000 AF in dry water years. Through conservation efforts (including piping of irrigation networks) and market-based incentives, instream flows have increased in the past decade. However, a further combination of these methods and potential new storage opportunities are necessary to ameliorate projected shortages in the upper basin. Opportunities for increasing flows include:

- ▶ Conservation: Piping of irrigation canals and laterals; improvement of on-farm equipment and operations; restoring wetlands, increasing connectivity of aquatic habitats and improving stream complexity.
- ▶ Market-based incentives: Water leasing; voluntary duty reduction; permanent transfer.
- ▶ Storage: Potential new or expanded reservoir storage and locations.
- ▶ Other management options: Additional Snow Telemetry (SNOTEL) Stations in the upper Crooked River basin; additional gauging of diversions; methods to improve hydraulic forecasting; groundwater-surface water exchanges to improve flows during dry years for Whychus Creek.

**Anticipated Outcome:** Changes in water allocation, storage, and mitigation that increase instream flows are expected to promote

anadromous lifecycle needs. Targets were established by the Deschutes Basin Habitat Conservation Plan (HCP) and will be modified by future stakeholder agreements.

**Evaluation Method:** Assessment of annual instream flows by tributary and whether they meet, exceed, or fall short of targets.

**Timeline:** Present and Future – Final HCP completed in 2021 with implementation through 2050.

**Lead Organization/Agency:** Basin-wide cooperative effort.

**Fish Committee Role:** No decision-making role.

**Related Studies/Actions/Decisions:**

**2021** – Completion of the [Deschutes River Basin Habitat Conservation Plan \(HCP\)](#), a collaborative strategy to share water resources in the Deschutes Basin through a variety of irrigation and related water management programs and projects, while enhancing fish and wildlife habitat. It's also recognized that additional work will be needed outside of the HCP process to meet stream flows necessary to promote anadromous life cycles, especially for Chinook, which were not a focal species of the final HCP.

**2014 - 2019** – [Upper Deschutes River Basin Study](#) evaluates a number of opportunities, tools, and barriers to addressing water supply and informing water management in the basin.

**2008 - 2019** – Development of Deschutes River Basin HCP, which will provide incidental take protections for the City of Prineville and members of the Deschutes Basin Board of Control.

**1996** – Stuart, A.M., Thiesfeld, S.L., Nelson, T.K., & Shrader, T.M. 1996. Crooked River Basin Plan Ochoco Fish District. Oregon Department of Fish and Wildlife, Salem, Oregon. Retrieved at <https://nrimp.dfw.state.or.us/nrimp/information/docs/fishreports/Crooked%20River%20Basin%20Plan%201996%20Final.pdf>.



**2014** – Crooked River Collaborative Water Security and Jobs Act. Amended the Wild and Scenic Rivers Act to adjust the Crooked River boundary, to provide water certainty for the City of Prineville, Oregon, and for other purposes. Retrieved at <https://www.congress.gov/bill/113th-congress/house-bill/2640>.

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## STRATEGY

# F: Improve Flow Management and Timing for Fish

**Description:** The U.S. Bureau of Reclamation’s (Reclamation) Bowman Dam, located on the Crooked River at about river mile 70, was initially authorized by Congress in 1956 to store and release water for irrigation, flood control and a minimum flow of 10 cubic feet per second (cfs) for fish and wildlife. The reservoir’s full storage capacity is 148,640 acre-feet (AF). The Crooked River Collaborative Water Security and Jobs Act of 2014 (Crooked River Act) amended the 1956 authorization to include specific storage volumes for authorized purposes and a process by which these specific volumes are released. The annual storage volumes include: 1) a first fill storage priority of 81,013 AF for irrigation and 5,100 AF for the City of Prineville’s groundwater mitigation requirements, and 2) up to 62,527 AF, after first fill is satisfied, may be stored and released to benefit fish and wildlife. The City of Prineville’s 5,100 AF is released for instream benefits and is additive to the volume stored for fish and wildlife, thus the total volume of storage available each year for fish and wildlife when the reservoir fills is 67,627 AF.

The Crooked River Act requires Reclamation to annually provide instream flow, to the maximum extent practicable, for the benefit of fish and wildlife. It also requires Reclamation to consult with the U.S. Fish and Wildlife Service and National Marine Fisheries Service (Services) to determine the release volumes and timing of fish and wildlife storage. The Services, in turn, consult with the Oregon Department of Fish and Wildlife and The Confederated Tribes of the Warm Springs Reservation of Oregon (Co-managers) in development of the annual water budget for fish and wildlife and for in-season adjustments.

**Anticipated Outcome:** Provide adequate flow volumes at appropriate times to help reintroduced steelhead and spring Chinook become re-established in the Crooked River basin and support important resident salmonid populations. Collaborate with federal, state, and tribal partners to legally protect fish and wildlife water released from Bowman Dam, downstream to Lake Billy Chinook; in 2021, Reclamation applied for a secondary water right from the state to protect fish and wildlife water from diversion.

The Deschutes Basin Habitat Conservation Plan (HCP), completed in 2020, provides for higher winter flows in the Deschutes River during the winter months and a guaranteed minimum flow of 50 cubic feet per second (cfs) in the Crooked River during very dry years (i.e., Prineville Reservoir only fills to 100,000 AF or less.)

**Evaluation Method:** Continued use of Portland General Electric's trapping and tag recovery data to help inform both flow volume and timing of release each year. Use Oregon Department of Fish and Wildlife's annual sampling data to evaluate impacts of interannual flow management on anadromous and resident salmonid populations.

**Timeline:** Present and Future.

**Lead Organization/Agency:** Bureau of Reclamation and the Services

**Fish Committee Role:** No role, but the Services and Co-managers are seated on the Fish Committee.

**Related Studies/Actions/Decisions:**

2021 – Completion of the [Deschutes River Basin Habitat Conservation Plan \(HCP\)](#), a collaborative strategy to share water resources in the Deschutes Basin through a variety of irrigation and related water management programs and projects, while enhancing fish and wildlife habitat. It's also recognized that additional work will be needed outside of the HCP process to meet stream flows necessary to promote

anadromous life cycles, especially for Chinook, which were not a focal species of the final HCP.

**2020** – USFWS, NOAA, and PGE tested how a “flow pulse” – a release from uncontracted storage at Prineville Reservoir – would impact downstream steelhead smolt outmigration in the Crooked River and through Lake Billy Chinook. The pulse appeared to move steelhead smolts down the Crooked River, however, it could not be determined if it ultimately resulted in an increase in the number of steelhead smolts that outmigrated to the SWW.

**2014** – Crooked River Collaborative Water Security and Jobs Act of 2014. Available at: <https://www.congress.gov/bill/113th-congress/house-bill/2640>.

**2005** – Northwest Power and Conservation Council. 2005. Deschutes Subbasin plan. NPCC, Portland, Oregon. Available at: <https://www.nwcouncil.org/subbasin-plans/deschutes-subbasin-plan>.

**2001** – Hardin, Tim. 2001. Physical habitat for anadromous species in the Crooked River below Bowman Dam. Prepared for U.S. Bureau of Reclamation, Boise, Idaho.

**1993** – Hardin, Tim. 1993. Summary report, Crooked River instream flow study. Prepared for Oregon Department of Fish and Wildlife, U.S. Bureau of Land Management and U.S. Bureau of Reclamation. Strategy



STRATEGY

## G: Modify Release Strategies in the Lower River

**Description:** Multiple studies provided indirect evidence that predation may be playing a substantial role in mortality of Chinook, sockeye, and steelhead smolts released below the Re-Regulation Dam. Radio-tagging revealed low smolt survival to the mouth of the river, with the highest mortality occurring between release and Trout Creek (Hill and Quesada 2016). Several potential mortality factors including disease, parasites, tagging/handling/transport mortality were considered, but avian and piscine predation were thought to be the most likely sources of smolt mortality below the Re-Regulation Dam. It has been shown that night-released Chinook and steelhead smolts have a significant survival advantage. Increased survival was present at the mouth of the Deschutes and persisted to Bonneville Dam (Mendez and Hill 2016).

**Anticipated Outcome:** Increase survival by modifying release strategies in the lower river to night releases of smolts by species and, likely, by water year/environmental conditions. Night releases of steelhead and Chinook smolts increased survival to the mouth of the Deschutes to 48% and 88%, respectively, over comparable day releases (Mendez and Hill 2016). The same relative smolt survival benefit would be expected for sockeye. As a result of the increased survival to the Columbia River, we expect this strategy to increase adult return numbers. Although, the effect will likely be minimal compared to the effect of ocean conditions on return rates and will require several years of returns to evaluate.

**Evaluation Method:** Results of the two years of study were definitive enough that this strategy has been implemented. An additional check on the effectiveness of this strategy will be to compare adult return rates from years where this strategy was implemented (2017-2021) to years

before it was implemented (2012 to 2017). Re-evaluation of the strategy to integrate utilization of the stress relief pond (Road Map Strategy H), constructed in 2021 at the Re-Regulation Dam in 2021, should be considered. Additionally, future re-evaluation of this strategy should be considered if there are significant reintroduction program changes.

**Timeline:** Present and Future – Started in 2017; anticipated to continue into future.

**Lead Organization/Agency:** Licensees.

**Fish Committee Role:** Information is brought to the Fish Committee for input.

**Related Studies/Actions/Decisions:**

**2021** – Stress relief pond constructed (see Strategy H). Studies in 2022 will help assess the release timing to minimize predation, etc.

**2017 - 2021** – Smolts are processed at the Selective Water Withdrawal (SWW) in the morning, then held at the SWW until the evening when they are loaded onto the trucks and released into the lower river.

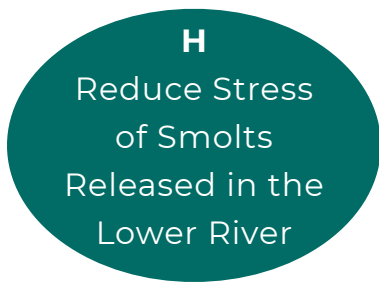
**2016** – Juvenile migration T&V study. Survival to the mouth of the Deschutes River was estimated for two release groups (day/night) each of Chinook, steelhead, and sockeye smolts. Predation between the release site and Trout Creek, indirectly identified as a significant mortality factor, was reduced by releasing smolts at night.

**2015** – Juvenile migration T&V study. Identified reaches in the lower Deschutes River where mortality might be occurring by using fixed radio telemetry stations and mobile tracking. Identified the river reach between the release site and Trout Creek as having the lowest survival for smolts of all three species.

**2014** – Juvenile migration T&V study. Predation was thought to be an issue so day and night releases were done. However, releases were not paired; day releases occurred one week earlier during a period when

flows were higher. Additionally, day releases coincided with large releases of hatchery steelhead potentially “swamping” predators and leading to biased survival rates.

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STRATEGY

## H: Reduce Stress of Smolts Released in the Lower River

**Description:** In the critical period following release, handling/transport-related stress can cause short-term increases in susceptibility to predation and disease, as well as changes in behavioral and physiological responses to the environment. Chinook, steelhead, and sockeye smolts released below the Re-Regulation Dam suffer significant mortality during their out-migration to Bonneville Dam, with the majority occurring between release and Trout Creek (Mendez and Hill 2016). Handling/transport stress can continue to affect post-release survival and reduced performance of smolts, the effects of which may persist through adult life.

There is abundant evidence that a recovery period would greatly reduce transport-induced stress and likely enhance post-release smolt survival. Some studies suggest that a recovery period, of as little as a few hours, may be sufficient for physiological recovery from stress, prior to liberation, and can significantly improve post-release survival and performance. However, recovery of behavioral traits, like aggression, territoriality, and learning ability, probably takes several days to weeks. The recently constructed Stress Relief Pond (SRP) will be used as a tool to reduce handling and transport stress of smolts released in the lower Deschutes River. Its present operation, on a daily release schedule, will not allow identification or removal of residual steelhead.

**Anticipated Outcome:** Higher average smolt survival in the reach between the Re-Regulation Dam and the mouth of the Deschutes River than previous smolt release strategies. Reduced mortality of smolts during their out-migration to the mouth of the Deschutes River, specifically in the reach between the Re-Regulation Dam and Trout



Creek, although the benefits of stress recovery are expected to be species- and water year-specific. Length of stress recovery would be logistically constrained but also be a balance between the short term (up to 7 days) benefit of improved survival and longer-term negative effects of prolonged containment.

**Evaluation Method:** It may take several years under a specific recovery regime (and a range of water years) to develop an average survival of “recovered” smolts from release to the Deschutes mouth. This average could be compared to the baseline survival estimates developed through prior release strategies. Any significant changes to the recovery regime or smolt program that may potentially impact post-release smolt survival should initiate Fish Committee discussion of whether post-release smolt survival may have been impacted and a re-evaluation of the recovery program is warranted.

**Timeline:** Present and Future – Stress relief pond was constructed and operational in 2021. Pond performance and fish behavioral response will inform design and operation of permanent structures in new Pelton rearing facility.

**Lead Organization/Agency:** Licensees.

**Fish Committee Role:** Information is brought to the Fish Committee for input.

**Related Studies/Actions/Decisions:**

**2021** – Interim stress relief pond completed in May 2021. Initial study of fish behavioral response completed in 2021; results included in 2021 Fish Passage Annual Report.

**2019** – First adults from nighttime releases start returning.

**2018** – ODFW acclimation studies. Acclimation of Chinook smolts in the Metolius and steelhead smolts in Whychus Creek and the Crooked River demonstrated higher survival to the Selective Water Withdrawal (SWW) than direct released smolts.

**2017 - present** – Based on studies described in Road Map Strategy G: Modify Release Strategies in the Lower River, PGE changed operations so that smolts are processed at the Selective Water Withdrawal (SWW) in the morning, then held at the SWW until the evening when they are loaded onto the trucks and released into the lower river. At the same time, PGE began discussions and budgeting for a permanent recovery facility to alleviate the safety concerns around daily nighttime trucking and realize additional benefits from recovery.

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I  
Direct Release of  
Upper Basin-  
Acclimated Smolts  
in the Lower River

## STRATEGY

# I: Direct Release of Upper Basin-Acclimated Smolts in the Lower River

**Description:** Currently, smolts are released into the tributaries upstream of Lake Billy Chinook (LBC). To reach the lower Deschutes River, smolts have to swim through the reservoir and enter the Selective Water Withdrawal fish collection facilities (SWW) at Round Butte Dam, where they are loaded onto trucks and transported to the lower Deschutes river.

Recent studies to-date have shown that reservoir passage efficiencies are low (approximately 20% for summer steelhead and 50% for spring Chinook). To increase the number of adults returning, the number of smolts reaching the lower river needs to increase. One interim solution to boost numbers is to directly release smolts into the lower Deschutes River, bypassing the SWW and reservoir (additional methods to do this are described in Strategies M, N, O, P, and Q). Specifically, a percentage of the total smolts released in the basin will be acclimated in the upper basin and then transported, via truck, around Round Butte Dam and directly released into the lower Deschutes River below the Re-Regulation Dam.

**Anticipated Outcome:** Increase smolt survival to the ocean by bypassing the reservoir, thereby increasing adult upper basin returns.

**Evaluation Method:** Comparing adult return rates before and after this strategy is implemented, relative to the number of smolts released, should allow managers to determine if this is a viable technique for increasing upper basin adult returns.

**Timeline:** Present and Future –This is an interim strategy designed to increase the number of adults produced from acclimated smolts in the near term. As natural production increases and smolt capture at the

SWW reaches sufficient numbers, the direct release of acclimated smolts into the lower river will be reduced and eventually terminated. ODFW will decide annually if, where, and how many of the acclimated smolts will be released into the lower river.

**Lead Organization/Agency:** Oregon Department of Fish and Wildlife (ODFW) and the Confederated Tribes of the Warm Springs Reservation of Oregon (CTWSRO) are the authorities for fish management decisions in the basin. With regards to reintroduction, the role of the Licensees is to facilitate and, in some cases, administer the methods that result from fish management decisions.

**Fish Committee Role:** Information is brought to the Fish Committee for input.

**Related Studies/Actions/Decisions:**

**2017 – present** – ODFW annually releases varying numbers of spring Chinook and summer steelhead smolts that were acclimated at the Opal Springs hydropower facility below the Re-Regulation Dam. Releases were not differentially marked.

**2018** – ODFW released 5,000 non-coded wire-tagged summer steelhead smolts that were acclimated at the Opal Springs hydropower facility below the Re-Regulation Dam.

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**J**  
Reduce Handling  
Stress at the  
SWW

## STRATEGY

# J: Reduce Handling Stress at the Selective Water Withdrawal (SWW)

**Description:** Migrating smolts are captured at the Selective Water Withdrawal (SWW), crowded into raceways, raised by an elevator into a fish sorting building where fish are given a maxillary fin clip to identify it as upper Deschutes Basin origin. Once clipped, the fish are placed in a raceway to recover before they are loaded into a transport truck and hauled to the Stress Relief Pond (SRP), prior to their release into the Deschutes River below the Project. Each time a fish is crowded, handled, or marked, there is stress on the fish. The cumulative effect of these stressors can cause short-term increases in susceptibility to predation and disease, as well as changes in behavioral and physiological responses to the environment. Handling/transport stress can continue to affect post-release survival and reduce performance of smolts, the effects of which may persist through adult life. This strategy entails continuing to evaluate the SWW fish processing procedure to identify where reasonable changes could be made to reduce handling/marking stress.

**Anticipated Outcome:** As we reduce fish handling stress, mortality of smolts during their out-migration in the lower river will decrease and a higher number of adults will return.

**Evaluation Method:** Many of these improvements are based on a significant body of literature documenting the positive benefits of reducing handling stress and would likely not need independent evaluation. For larger scale changes, like not marking sockeye, comparative analysis of years before and after the treatment could be used to help control for the varying natural factors, such as ocean conditions. For example, smolt-to-adult returns from marking years

(2012-2013, 2016-2018) could be compared to smolt-to-adult returns from non-marking years.

**Timeline:** Present and Future – Ongoing effort to reduce handling stress.

**Lead organization/Agency:** Licensees.

**Fish Committee Role:** Information is brought to the Fish Committee for input.

**Related Studies/Actions/Decisions:**

**2018** – Decision by Co-managers (Oregon Department of Fish and Wildlife (ODFW) and The Confederated Tribes of the Warm Springs Reservation of Oregon (CTWSRO)) to cease marking sockeye at the SWW in 2019.

**2014 - 2015** – Sockeye not marked at the SWW.

**2010 - present** – Annual evaluation of a subset of fish for descaling and injury. Mortalities taken to ODFW pathologist to determine if cause of death was facility induced.

**2010 - present** – Fish handling improvements identified and implemented, including: adding stress coat to fish totes and transport trucks, reducing crowding in lift baskets, netting raceways, electric predator exclusion fencing, fish handling training for technicians by ODFW pathologists, debris barrier net, and night shifts when debris loading is high.

**2010 - 2015** – Comparison of sockeye smolt-to-adult returns between marked and unmarked smolts. Average smolt-to-adult returns of marked sockeye smolts (2010-2013; 0.082) was significantly worse than the average smolt-to-adult returns (0.204) in the two years (2014 and 2015) they weren't marked. This suggests that stress associated with handling/markings reduced post-release performance.

**2010 - 2011** – Facility Evaluation Report test and verification study. Initial SWW studies to evaluate fish survival and injury.

## K

### Modify Hatchery Practices

## STRATEGY

# K: Modify Hatchery Practices

**Description:** In 2020, a major adaptive management change occurred to the reintroduction program. Fry stocking was terminated and the number of both spring Chinook and summer steelhead smolts released increased from 50,000 to 100,000. After comparing the current hatchery practices for the rearing of the reintroduction smolts at Wizard Falls and Fall River hatcheries with those at Round Butte Hatchery, changes were made to the rearing practices to increase efficiency and smolt quality. Summer steelhead are now graded into three different size classes prior to ponding and fish will be fed accordingly, per individual raceway, to meet target release size. A more natural feed protocol for spring Chinook was implemented; smolts will be fed heavily in the spring and fall but receive a reduced feed ration in the winter months. This feeding protocol mimics how a smolt would feed in a natural environment and has shown to have success in a study currently being conducted by National Marine Fisheries Service (NOAA Fisheries). Eight weeks prior to release, all smolts will have a change in feed type to one that has been shown to help increase smoltification. Size at release goals have also been changed to five fish per pound (fpp) for summer steelhead and 18 fpp for spring Chinook.

**Anticipated Outcome:** Production of higher quality, more uniform smolts should increase the number of fish that outmigrate through the reservoir and are captured at the Selective Water Withdrawal (SWW).

**Evaluation Method:** A condition factor measurement will be used to evaluate smolt quality at the hatchery prior to release. Also, a random sample will be taken to look at size at release of the entire release group. This will occur in order to analyze for size uniformity and compare fish to the established target size at release. Once these changes are

implemented, a comparison of previous rearing practices will be made looking at the numbers of smolts collected at the SWW with the new rearing practices. These strategies will need to be evaluated at each hatchery for each species.

**Timeline:** Present and Future – Changes to the rearing practices at Wizard Falls and Fall River hatcheries have been instituted. Changes will be studied and adaptive management changes will be made accordingly to continue to improve the smolt quality.

**Lead Organization/Agency:** Oregon Department of Fish and Wildlife (ODFW).

**Fish Committee Role:** The Fish Committee will be informed but does not have a decision-making role.

**Related Studies/Actions/Decisions:**

**2017 - ongoing** – Ongoing NOAA Fisheries/ODFW Spring Chinook Pelton Ladder Study.

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STRATEGY

# L: Acclimate Smolts in Tributaries

**Description:** Acclimation has been used throughout the Pacific Northwest to imprint anadromous hatchery fish on water sources, prior to release. Studies have shown that acclimation helps imprint smolts, decrease smolt outmigration time, increase smolt-to-adult return rates, and decrease straying of adult fish. Oregon Department of Fish and Wildlife (ODFW) conducted experimental acclimation on reintroduction smolts in 2018. Results found that a significantly higher number of acclimated smolts, 30 - 60% higher, depending on release group and site, were captured at the Selective Water Withdrawal (SWW), compared to a non-acclimated direct-release group. As a result of this finding, permanent modular tank acclimation facilities have been completed on the Metolius River and Whychus Creek. The long-term plan, as funding and permitting allow, is to develop permanent facilities, on all three upper basin tributaries, capable of acclimating all spring Chinook and summer steelhead prior to release. In the interim, a variety of temporary sites and methods will be used to acclimate smolts.

**Anticipated Outcome:** Increased smolt outmigration, survival, and number of fish captured at the SWW. This should facilitate an increase in the number of upper basin adults returning and a decrease in straying that occurs in the tributaries above the reservoir.

**Evaluation Method:** A percentage of each individual release group will be PIT-tagged prior to release, for both spring Chinook and summer steelhead, in each acclimation facility. Fish will then be released and monitored to determine the percentage of fish from each group that are captured at the SWW. These numbers can then be compared to the percentages prior to acclimation. Returning adults will be monitored for

PIT tags to look at the numbers of adults returning pre- and post-acclimation. In addition, stray rates of acclimated adults that return can be studied by comparing straying of adults before and after acclimation.

**Timeline:** Present and Future – Practices started in 2017.

**Lead Organization/Agency:** ODFW.

**Fish Committee Role:** Information is brought to the Fish Committee for input.

**Related Studies/Actions/Decisions:**

**2019 – ongoing** - ODFW begins development of smolt acclimation program using temporary facilities in 2019. Permanent Modutank facilities are completed at the Deschutes Land Trust - Camp Polk property in 2020 and at ODFW's Wizard Falls Hatchery in 2021. Percentage of smolts acclimated in permanent and temporary facilities increases until 2021 when 100% of smolts are acclimated prior to release.

**2018** – ODFW experiments with acclimation of reintroduction smolts at Camp Sherman pond and Opal Springs. Results found a significantly higher number of acclimated smolts, 30 – 60% higher, depending on release group and site, were captured at the SWW compared to a non-acclimated direct-release group.

**2017** – ODFW conducted a study looking at acclimating fish at Opal Springs facility.

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## M

Incorporate  
Wild Fish into  
Broodstock

## STRATEGY

# M: Incorporate Wild Fish into Broodstock

**Description:** The Reintroduction and Conservation Plan for Anadromous Fish in the Upper Deschutes River Subbasin identifies wild Deschutes River summer steelhead and Warm Springs wild spring Chinook as preferred broodstock. Currently, the Round Butte Hatchery (RBH) summer steelhead broodstock and RBH Chinook broodstock are being used for the upper Deschutes Basin reintroduction program. Wild steelhead and Chinook have not been incorporated into RBH broodstock since the 1990s. Research has shown wild fish are more disease resistant, have higher survival and fecundity, and increased smolt-to-adult returns in comparison to hatchery fish. In 2017, the Oregon Department of Fish and Wildlife (ODFW) recommended that the National Marine Fisheries Service (NOAA Fisheries) consider allowing ODFW to incorporate wild steelhead into the RBH broodstock. Wild steelhead would be prioritized for use in the reintroduction program, prior to any use by RBH for non-reintroduction purposes. NOAA Fisheries is currently reviewing the draft Hatchery Genetic Management Plan submitted by ODFW. Prior to any take of wild steelhead at the Pelton adult trap, escapement goals for the lower Deschutes River must be met. At this time, Chinook are not being considered for incorporation into the broodstock because the trend in annual adult returns to tributaries of the lower Deschutes River has been declining since the early 2000s.

**Anticipated Outcome:** Improved smolt product for use in the reintroduction program that will increase survival and outmigration of smolts through the reservoir, thereby increasing upper basin adult returns to Pelton adult trap.

**Evaluation Method:** Evaluation of wild fish incorporation into the RBH broodstock used for the upper Deschutes Basin will occur at multiple levels. First, at the hatchery level for disease rates and survival of egg to smolt. Second, for smolt releases above the reservoir evaluating: smolt outmigration, residence time in the reservoir, capture efficiency at the Selective Water Withdrawal (SWW), and outmigration below the Re-Regulation Dam to Bonneville Dam. Third, through evaluation of smolt to adult returns, adult stray rates once passed above the reservoir, and spawning. Progeny from natural origin (wild) broodstock will be differentially marked to facilitate evaluation of performance in comparison to original RBH stock.

**Timeline:** Discussion regarding steelhead started in 2017 and is ongoing. There are no plans to incorporate Chinook into the broodstock at this time.

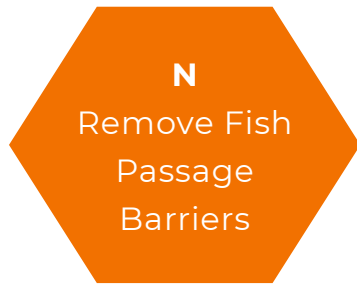
**Lead Organization/Agency:** Fish Co-Managers (ODFW and Confederated Tribes of Warm Springs Oregon (CTWSRO) and NOAA Fisheries.

**Fish Committee Role:** The Fish Committee will be provided with information.

**Related Studies/Actions/Decisions:**

**2017** – Hatchery Genetic Management Plan (HGMP) documents were presented by ODFW to NOAA Fisheries for review. ODFW, NOAA Fisheries, and the CTWSRO plan to revisit wild steelhead incorporation into hatchery broodstock.

**2008** – Oregon Department of Fish and Wildlife and Confederated Tribes of the Warm Springs Reservation of Oregon. 2008. Reintroduction and Conservation Plan for Anadromous Fish in the Upper Deschutes Subbasin identifies wild fish as the preferred source of broodstock to initiate the reintroduction effort.



## STRATEGY

# N: Remove Fish Passage Barriers

**Description:** Since the 1920s, habitats upstream of the Pelton Round Butte Hydroelectric Project (Project) have been inaccessible to anadromous salmonids. As part of the Federal Energy Regulatory System (FERC) relicensing, fish passage at Round Butte Dam was restored on December 3, 2009 (notice of completion filed with FERC February 23, 2010). However, in some Deschutes River tributaries, fish passage remains impaired by structural barriers, such as dams, culverts, and irrigation diversions. A significant limiting factor for steelhead production above the Project is the partial upstream adult migration barrier at Opal Springs Dam on the Crooked River (Carmichael and Taylor 2009). Construction of new fish passage facilities was initiated in 2018 and is scheduled for completion in 2019. The Deschutes Subbasin Plan (2004) and Crooked River Basin Plan (1996) state that the restoration of fish passage would not only allow access to historical spawning and rearing habitats for anadromous fish, thereby increasing production, but would also help to reconnect fragmented resident fish populations. Other than at the Project, fish passage projects are conducted by authorities other than the Licensees. However, some members of the Fish Committee, who are on the Pelton Fund Technical Review Team, analyze funding applications for some of those projects, as numerous projects have been funded, in part, by the Pelton Fund.

**Anticipated Outcome:** Removal of barriers to fish migration will provide additional access to spawning and rearing habitats for anadromous and resident fish populations. Subsequently, basin-wide fish production has the potential to increase.

**Evaluation Method:** Variable dependent upon the implementation organization.

**Timeline:** Present and Future.

Including the Project, there has been extensive fish passage work conducted throughout the reintroduction area. Below are some examples of ongoing or proposed fish passage projects that are pertinent to reintroduction efforts. The years listed represent the estimated completion year(s).

- ▶ Whychus Creek Plainview Dam removal and fish screen installation – 2019/2020.
- ▶ Ochoco Creek Prineville Country Club irrigation diversion fish passage – 2020.

Lead Organization/Agency: Most fish passage projects that pertain to the reintroduction of anadromous salmonids are implemented by the Upper Deschutes Watershed Council or the Crooked River Watershed Council, in cooperation with private landowners. Generally, other Deschutes Basin project partners and stakeholders have the opportunity to provide input on project plans or designs as part of funding applications or coordination meetings. All fish passage projects must meet Oregon Department of Fish and Wildlife (ODFW) and National Marine Fisheries Service (NOAA Fisheries) Fish Passage criteria.

**Fish Committee Role:** No decision-making role, excluding the Project.

**Related Studies/Actions Decisions:**

**2019** – Deschutes Valley Water District completes construction on a fish ladder at the Opal Springs Hydroelectric Project.

**2009** – Carmichael, R., and Taylor, B. 2009. Conservation and Recovery Plan for Oregon Steelhead Populations in the Middle Columbia River Steelhead Distinct Population Segment. Oregon Department of Fish and Wildlife, Salem, Oregon. Retrieved at [https://www.dfw.state.or.us/fish/CRP/docs/mid\\_columbia\\_river/Oregon\\_Mid-C\\_Recovery\\_Plan\\_Feb2010.pdf](https://www.dfw.state.or.us/fish/CRP/docs/mid_columbia_river/Oregon_Mid-C_Recovery_Plan_Feb2010.pdf).

**2004** – Deschutes Subbasin Plan. 2004. Retrieved from <https://www.nwcouncil.org/subbasin-plans/deschutes-subbasin-plan>.

**1996** – Stuart, A.M., Thiesfeld, S.L., Nelson, T.K., & Shrader, T.M. 1996. Crooked River Basin Plan Ochoco Fish District. Oregon Department of Fish and Wildlife, Salem, Oregon. Retrieved at <https://nrimp.dfw.state.or.us/nrimp/information/docs/fishreports/Crooked%20River%20Basin%20Plan%201996%20Final.pdf>.

ODFW Fish Passage Inventories and Statewide Fish Passage Priority List. Retrieved from <https://www.dfw.state.or.us/fish/passage/inventories.asp>.

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## STRATEGY

# O: Improve Fish Habitat

**Description:** The Deschutes Subbasin Plan (2004) and Crooked River Basin Plan (1996) state that riparian and floodplain degradation, as well as the loss of instream habitat complexity, are factors that have led to the decline of aquatic species. Degraded conditions, such as floodplain connectivity and function, channel structure, and instream large wood recruitment, have limited the viability of steelhead within the basin (Carmichael and Taylor 2009). Basin-wide fish habitat improvements aim to address many of the factors that limit the production of anadromous and resident fish species. For example, the 2015 Strategic Action Plan for the Deschutes Partnership (consisting of the Upper Deschutes Watershed Council, Crooked River Watershed Council, Deschutes River Conservancy, and Deschutes Land Trust) stated that the partnership was initiated to create an all-inclusive restoration program focused on improving fish habitat conditions, with regards to the reintroduction of anadromous salmonids to the upper Deschutes Basin. Fish habitat improvement projects are conducted by authorities other than the Licensees. However, some members of the Fish Committee, who are on the Pelton Fund Technical Review Team, analyze funding applications for some of those projects, as numerous projects have been funded, in part, by the Pelton Fund.

**Anticipated Outcome:** Fish habitat improvements may increase spawning and rearing habitat capacity for anadromous and resident species. Thus, fish production has the potential to increase.

**Evaluation Method:** Variable dependent upon the implementation organization. ODFW AQI habitat survey data may prove useful in documenting habitat quality changes.



**Timeline:** Present and Future -There have been extensive stream restoration projects throughout the reintroduction area. Below are some examples of ongoing or proposed projects that are pertinent to reintroduction efforts. The years listed represent the estimated completion year(s).

- ▶ Whychus Creek canyon floodplain restoration; additional phases – 2021-2023
- ▶ Whychus Creek floodplain restoration at Willow Springs – 2022-2024
- ▶ Crooked River and tributaries floodplain restoration at Ochoco Preserve – 2022-2025
- ▶ McKay Creek restoration at Wine Down Ranch – 2023

**Lead Organization/Agency:** Most stream restoration projects that pertain to the reintroduction of anadromous salmonids are implemented by the U.S. Forest Service, Upper Deschutes Watershed Council, or the Crooked River Watershed Council, in cooperation with private landowners. Generally, other Deschutes Basin project partners and stakeholders have the opportunity to provide input on project plans or designs as part of funding applications or coordination meetings.

- ▶ All stream restoration projects must comply with Oregon Department of Fish and Wildlife, Oregon Department of State Lands, and U.S. Army Corps of Engineers in-water work requirements.
- ▶ Regulated by the U.S. Fish and Wildlife Service, Endangered Species Act conservation measures for bull trout must be incorporated into project design and implementation, where applicable.

**Fish Committee Role:** No decision-making role, excluding the Project.

**Related Studies/Actions/Decisions:**

**2020** – The Pelton Fund awards \$4.5 million to agencies and non-profits working on habitat improvement in the Deschutes Basin. Projects include fish passage barrier removal, instream work, riparian protection, land acquisition, etc.

**2015** – Upper Deschutes Watershed Council, Crooked River Watershed Council, Deschutes River Conservancy, and Deschutes Land Trust. 2015. Fish Habitat Restoration in the Upper Deschutes Basin – Strategic Action Plan.

**2009** – Carmichael, R., and Taylor, B. 2009. Conservation and Recovery Plan for Oregon Steelhead Populations in the Middle Columbia River Steelhead Distinct Population Segment. Oregon Department of Fish and Wildlife, Salem, Oregon. Retrieved at [https://www.dfw.state.or.us/fish/CRP/docs/mid\\_columbia\\_river/Oregon\\_Mid-C\\_Recovery\\_Plan\\_Feb2010.pdf](https://www.dfw.state.or.us/fish/CRP/docs/mid_columbia_river/Oregon_Mid-C_Recovery_Plan_Feb2010.pdf).

**2004** – Deschutes Subbasin Plan. 2004. Retrieved from <https://www.nwcouncil.org/subbasin-plans/deschutes-subbasin-plan>.

**1996** – Stuart, A.M., Thiesfeld, S.L., Nelson, T.K., & Shrader, T.M. 1996. Crooked River Basin Plan. Ochoco Fish District. Oregon Department of Fish and Wildlife, Salem, Oregon. Retrieved at <https://nrimp.dfw.state.or.us/nrimp/information/docs/fishreports/Crooked%20River%20Basin%20Plan%201996%20Final.pdf>.

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P

Direct Release of  
Excess Hatchery  
Broodstock into  
Spawning Habitat

STRATEGY

## P: Direct Release of Excess Hatchery Broodstock into Spawning Habitat

**Description:** The annual returns of adult known origin summer steelhead and spring Chinook salmon have been limited. The passage of excess hatchery broodstock, combined with known origin passage, increases the likelihood of natural production above the Round Butte Dam. To date, only isolated, sporadic spawning has been documented from releases of known origin adult summer steelhead and spring Chinook into Lake Billy Chinook. Radio telemetry has shown that many of these fish migrate up one tributary, only to migrate back into the reservoir and into a different tributary. Directly releasing these fish near suitable spawning habitat, or in the proximity of holding adults, increases the probability of successful spawning. This strategy is currently being implemented for spring Chinook. Excess broodstock may not be available every year because the broodstock needs of Round Butte, Warm Springs National, and Parkdale fish hatcheries will be prioritized. At this time, there are no plans to release excess steelhead brood upstream of the Project, due to disease concerns and potential genetic impacts on native redband trout.

**Anticipated Outcome:** It is anticipated that natural production will increase by directly releasing adult excess hatchery broodstock and known origin adults near suitable spawning habitats. Furthermore, it is likely that increased natural production will lead to a greater abundance of outmigrants.

**Evaluation Method:** Redd surveys, radio telemetry, and tributary screw trap operations will inform evaluators on the efficacy of this action.

**Timeline:** Present and Future – Beginning in 2019, administer this strategy for spring Chinook; re-evaluate the efficacy of this strategy in

future years and discontinue it when Co-managers (Oregon Department of Fish and Wildlife (ODFW) and The Confederated Tribes of the Warm Springs Reservation of Oregon (CTWSRO)) agree that natural production has reached an acceptable level. Evaluate the need for direct releases of excess hatchery broodstock steelhead in future years.

**Lead Organization/Agency:** ODFW and CTWSRO are the authorities for fish management decisions in the basin. With regards to reintroduction, the role of the Licensees is to facilitate and, in some cases, administer the methods that result from fish management decisions.

**Fish Committee Role:** Information is brought to the Fish Committee for input.

**Related Studies/Actions/Decisions:**

**2021** – ODFW and CTWSRO agree to pass excess Warm Springs Hatchery spring Chinook broodstock into the Metolius River for the duration of the 2021 run.

**2018** – ODFW and CTWSRO agree to pass up to 200 excess Round Butte Hatchery broodstock spring Chinook into the Metolius River beginning in 2019.

**2012 - present** – Annual Adult Migration, Survival and Spawning Test and Verification Studies. Retrieved at <http://www.portlandgeneral.com/deschutesstudies>.

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Direct Release  
Returning Upper  
Basin Adults into  
Holding or Spawning  
Habitat

## STRATEGY

# Q: Direct Release Returning Upper Basin Adults into Holding or Spawning Habitat

**Description:** This strategy is currently only proposed for future consideration. The long-term goal of the reintroduction process is that, assuming there are robust numbers of returning adults, these adults would have volitional passage through the reservoir into natal streams; direct release into the tributaries does not support this goal. To date, because we are in the initial stages of the reintroduction and adult returns are low, we have only documented isolated and sporadic spawning in returning upper basin adults that have been passed above the hydropower project into Lake Billy Chinook. Radio tracking studies demonstrate that a portion of upper basin adult fish migrate up one tributary, only to outmigrate back into the reservoir and into a different tributary. This behavior could be a result of fish searching for a mate and/or trying to use olfactory cues to home back to the tributary in which they were released. By directly releasing adults near suitable holding or spawning habitat, fish may have a better probability of successfully spawning, due to the proximity of a mate and suitable spawning habitat. This strategy could require differential marking of smolts from tributary releases to ensure adults were released into the correct natal stream. Releasing adults into the tributary from which they did not originate could exacerbate straying, but this could still be considered if that risk could be balanced by the increased probability of successful spawning. However, alternative adaptive management measures should be thoroughly evaluated by the fish managers and Fish Committee prior to implementation of this strategy.

**Anticipated Outcome:** Directly releasing adult fish near suitable spawning habitat may increase the probability that potential mates would find each other and successfully spawn. However, transported adults could be disoriented and migrate out of the system rather than spawn.

**Evaluation Method:** Redd surveys, radio telemetry, tributary screw trap operations, and/or PIT tagging will inform evaluators on the efficacy of this action.

**Goal:** Increase successful spawning and natural production in tributaries.

**Timeline:** For Future Consideration – Possible Future Adaptive Management Action.

**Lead Organization/Agency:** The Oregon Department of Fish and Wildlife and The Confederated Tribes of the Warm Springs Reservation of Oregon are the authorities for fish management decisions in the basin. With regards to reintroduction, the role of Licensees is to facilitate and, in some cases, administer the methods that result from fish management decisions.

**Fish Committee Role:** Information is brought to the Fish Committee for input.

**Related Studies/Actions/Decisions:**

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## R

### Fish Health Management Considerations

## STRATEGY

# R: Fish Health Management Considerations

**Description:** Fish health management is a term to describe a variety of preventive and therapeutic practices which are designed to prevent and control the spread of disease agents in fish populations. The tools in a disease management program can include vaccines (if available), antibiotics (used to treat bacterial diseases), other therapeutics (which can be applied to the water), treatment of fish with federally approved drugs or food additives (that may stimulate immunity in general), biosecurity, and optimal rearing conditions (good nutrition and husbandry practices) that minimize stress on the fish. To date, current examples of this strategy are: 1) the inoculation of returning upper basin adults with oxytetracycline to reduce bacterial infections resulting from handling/transport stress-induced immunosuppression (in addition to increasing adult survival, this practice works to reduce the spread of bacterial infections in the upper basin); 2) feeding hatchery spring Chinook smolts SLICE feed to reduce incidence of copepod infection during reservoir transit, and 3) feeding hatchery smolts erythromycin to control the prevalence and severity of bacterial kidney disease (BKD) caused by *Renibacterium salmoninarum*.

**Anticipated Outcome:** Reducing smolt and adult mortality will increase the number of adults returning and should increase natural production in the tributaries.

**Evaluation Method:** Evaluating the benefit of certain practices could inherently be easier for some more so than others. For example, the use of SLICE feed demonstrably reduced the severity of copepod infection captured at the SWW, whereas the benefits of inoculation of returning adults with antibiotics to reduce bacterial infections is a good faith effort

based on sound fish health management science. ODFW is aware of concerns related to overuse of antibiotics and will periodically review their Present and Future use.

**Timeline:** Present and Future – This strategy is currently being implemented, but future adaptive actions may present themselves as the reintroduction program progresses.

**Lead Organization/Agency:** The Oregon Department of Fish and Wildlife and The Confederated Tribes of the Warm Springs Reservation of Oregon are the authorities for fish management decisions in the basin, with the on-site ODFW Fish Pathologist often making most of the decisions, with regards to fish health management.

**Fish Committee Role:** Where appropriate, information is brought to the Fish Committee for input.

**Related Studies/Actions/Decisions:**

**2021** – ODFW obtains authorization to utilize SLICE feed on hatchery spring Chinook smolts. Initial results suggest a decrease in severity of copepod infection during outmigration to SWW.

**2015** – ongoing – ODFW will continue to monitor the annual progression and severity of copepod infection in outmigrating spring Chinook captured at the SWW.

**2010** – ODFW began inoculation of returning upper basin adults with oxytetracycline to reduce bacterial infections.

**2007** – Licensees fund a full-time ODFW position, stationed at Pelton Round Butte, to evaluate fish health impacts of the Project



**S**  
Focus  
Reintroduction  
Efforts in Specific  
Tributaries

**STRATEGY**

# **S: Focus Reintroduction Efforts in Specific Tributaries**

**Description:** During early stages of the reintroduction effort, numbers of returning adults to any specific tributary may be too low to ensure the probability of pairing and spawning. To increase the probability of successful spawning, actions may be undertaken to increase the number of adults in a specific tributary. These actions could take place at either the juvenile or adult stage. An example already undertaken is the fish managers’ decision to place additional hatchery Chinook salmon broodstock only in the Metolius River. Other changes that could be made in the future would be to shift the proportion of resources to a tributary by acclimating a disproportionate number of smolts or transporting all returning adults to that specific tributary. The concept would be that once a spawning population is established in one tributary, “excess” adults would be available to populate other tributaries through straying and/or a shift in focus of reintroduction efforts. The degree of program shift could be species specific and likely would entail a shift in the proportion of resources between tributaries rather than an abandonment of any specific tributary effort.

**Anticipated Outcome:** The goal of these actions would be to increase the number of adults in any one tributary in order to increase the probability of successful reproduction.

**Evaluation Method:** Radio tracking of adults and spawning surveys could be used to evaluate the number of adults spawning, while evaluation of the level of successful spawning could be monitored through operation of screw traps to capture outmigrating smolts in the tributary of focus.

**Timeline:** Present and Future – This strategy is currently being implemented to a limited degree; future shifts in reintroduction effort could vary in degree and scope.

**Lead Organization/Agency:** The Oregon Department of Fish and Wildlife and The Confederated Tribes of the Warm Springs Reservation of Oregon are the authorities for fish management decisions in the basin.

**Fish Committee Role:** Where appropriate, information is brought to the Fish Committee for input.

**Related Studies/Actions/Decisions:**

**2021** – ODFW and CTWSRO approved 2021 transfer of excess Warm Springs Hatchery spring Chinook broodstock into the Metolius River once all other hatchery and tribal needs were met.

**2019 – ongoing** – ODFW and CTWSRO provided direction that up to 200 excess Round Butte Hatchery spring Chinook broodstock could be transported to appropriate spawning habitat in the Metolius River.

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